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Optimizing Greenhouse Rice Production: Do Photoperiod Treatments Hasten Flowering?

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Purdue Methods: Optimizing Greenhouse Rice Production

Do photoperiod treatments hasten flowering?

Short Answer: Yes, dramatically. A short day treatment of 1-2 weeks can halve production time, producing plants in full flower within 10 weeks.

In our greenhouses, the number of days to flowering varied substantially according to season, taking as long as 6 months in winter. Applying a short-day treatment (16-hour darkness) not only sped up research, but made it less likely the plants had pests or culture problems such as salts accumulation, due to their shorter duration in the greenhouse.

Fortunately, unlike poinsettia and chrysanthemum crops, the short day treatment only need be applied for 1-2 weeks. We applied the short day treatments either by covering crops with a black-out curtain from 4:00PM – 8:00AM each day, or by using a plant growth chamber programmed with the same timing.

Our photoperiod recommendations provide researchers options depending on their goals. The standard production technique we've developed is to grow the plants vegetatively for seven weeks, apply one week of short day, then resume the long day. This resulted in about 20 seed panicles per plant in about 14 weeks from emergence. An accelerated method only produced about 10 panicles, but production time was cut to 10 weeks. We grew the plants four weeks in long day, 2 weeks in short day, then resumed long day. Finally, we used a plant growth chamber on a set of plants in very small pots under continuous short day conditions. Plants developed about 5 panicles per plant in about 7 weeks. This "constant short day" method can hasten research that requires only a few dozen seed, or where there is limited growth space.

Notes and Acknowledgements: The timing and duration of the treatments were based on advice from Michael Dyer at University of Washington at St. Louis and Michael Mucci at the University of Guelph. William Bartz of the University of Delaware advises that if we increased our photoperiod to 11 hours in the "constant short day" method, we may see flowering in as little as 4 weeks.

This document is based on materials originally posted to the Purdue University HLA Department Plant Growth Facility web site: http://www.hort.purdue.edu/hort/facilities/greenhouse/RiceMethod.shtml

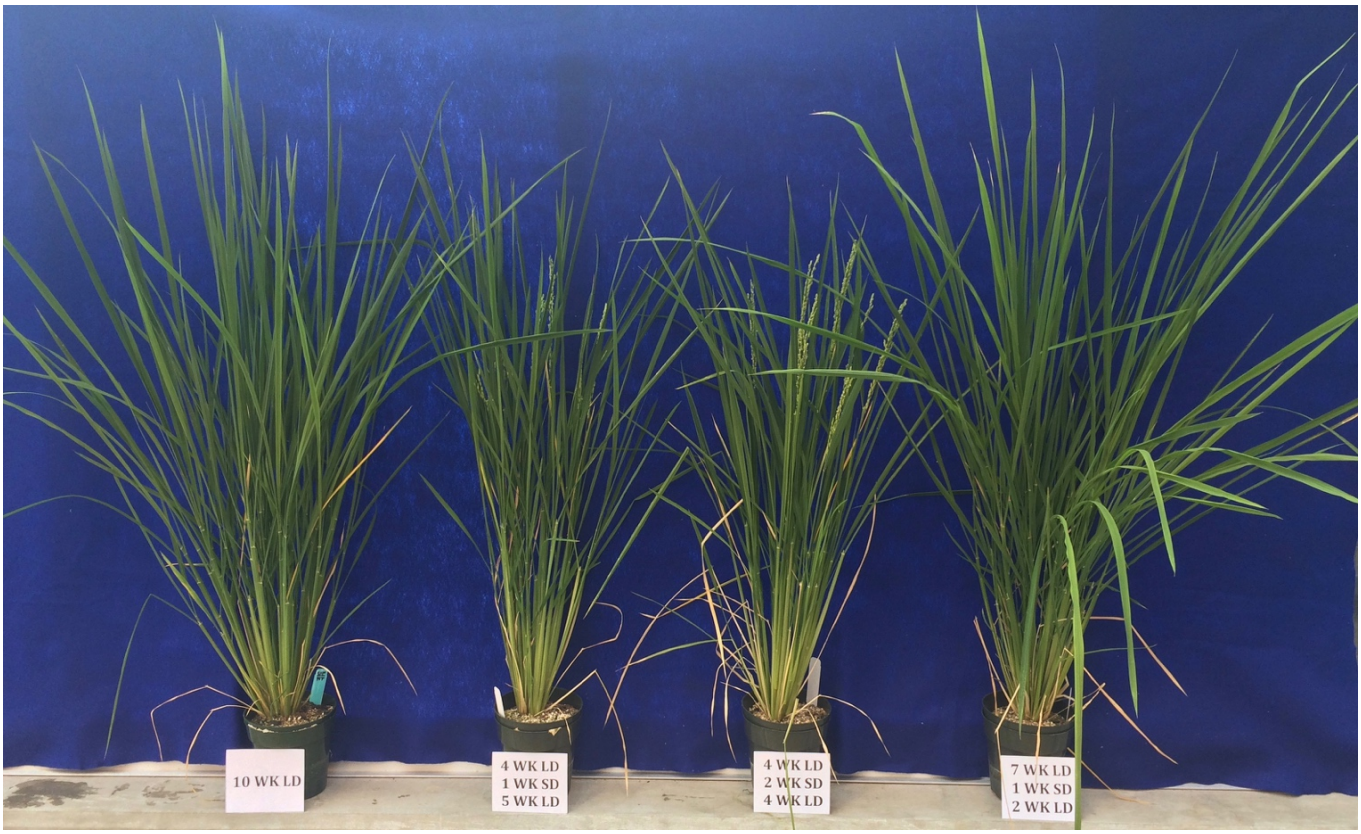

Figure 1. Rice plants grown ten weeks after seed emergence under differing long day (LD) and short day (SD) sequences. From left to right: 10 weeks LD; 4 weeks LD/1 week SD/5 weeks LD; 4 weeks LD/2 weeks SD/4 weeks LD, and 7 weeks LD/1 week SD/3 weeks LD. Note the full flowering of 4/2/4 sequence treatment, second from right.

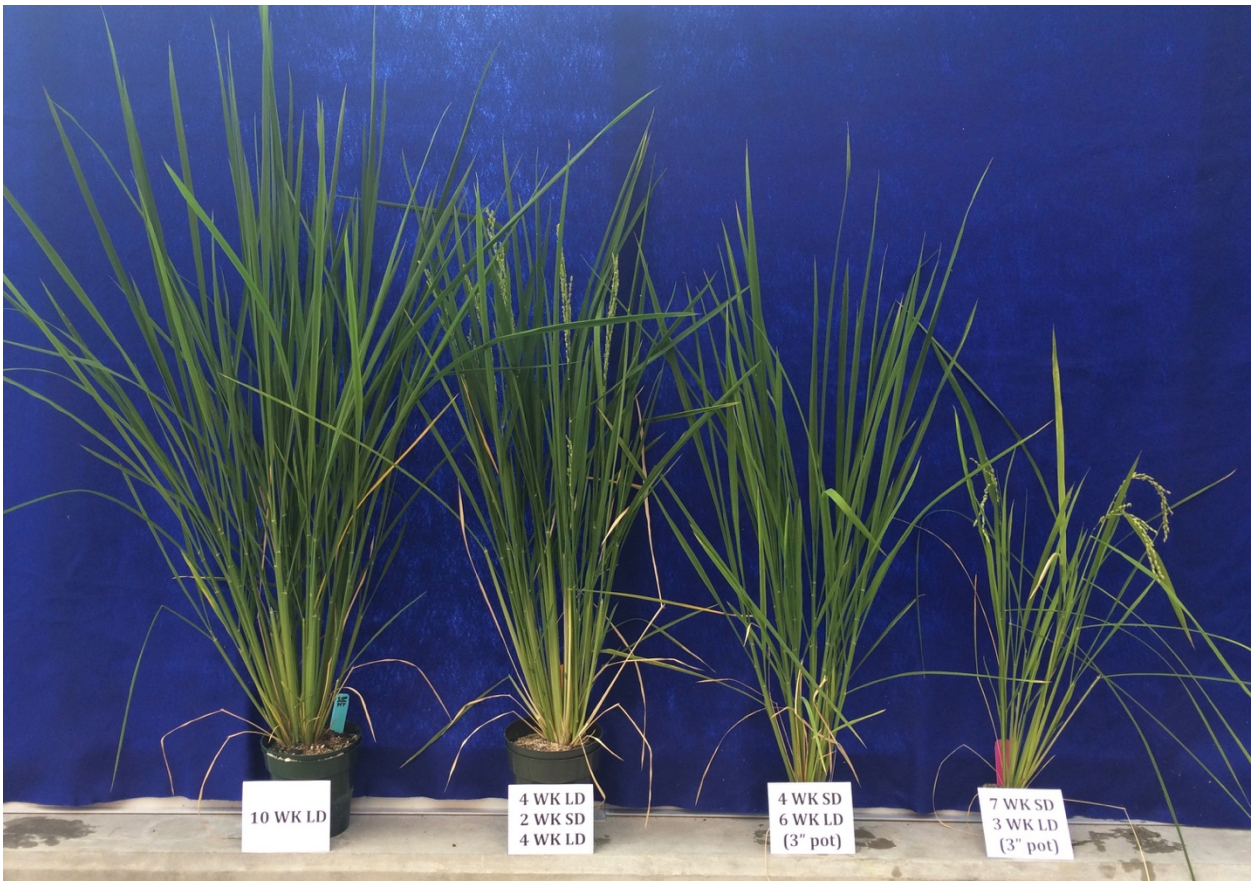

Figure 2. Rice plants grown ten weeks after seed emergence under differing long day (LD) and short day (SD) sequences. From left to right: 10 weeks LD; 4 weeks LD/2 weeks SD/4 weeks LD; 4 weeks SD/6 weeks LD, and 7 weeks SD/3 weeks LD. The two treatments on the right were grown in a growth chamber under SD settings, then moved to a LD greenhouse. Note the full flowering of 4/2/4 and the 7/3 sequence treatments.